Investigating the Potential Range Expansion of the Vector Mosquito *Aedes Aegypti* in Mexico with NASA Earth Science Remote Sensing Results

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- Dengue (Breakbone) fever is caused by one of four viruses carried by mosquitoes in tropical and subtropical areas.

- Cases have increased dramatically in the past few decades; there are currently ~100 million infections annually around the globe.

- Our project will integrate environmental observations, including weather, land use, vegetation type, amount and greenness, soil moisture, and mosquito populations with investigations of the human dynamics of the system via household surveys.

Aedes Aegypti

Collaborators

- Williams Crosson, Ph.D. (PI) USRA
- Sue Estes (Co-PI) NASA/MSFC
- Mary Hayden (Co-PI) NCAR
- Maury Estes, (Co-I) NASA/MSFC
- Sarah Hemmings (Co-I) USRA
- Dan Irwin (Co-I) NASA/MSFC
- Andrew Monaghan (Co-I) NCAR
- Max Moreno, (Co-I) NASA Post Doctorial
- Dale Quattrochi (Co-I) NASA/MSFC
- Carolos Manuel Welsh, (Co-I) University of Vera Cruz
- Emily Zielinski-Gutierrez, (Co-I) CDC

Project Activities

- Collect data on mosquito abundance at several hundred locations within ten sampling areas on a transect from Veracruz near sea level to Puebla and Perote at >7000 feet above sea level (July-September 2011)

- Conduct household surveys to determine human factors related to disease exposure (summer 2011)

- Collect satellite data for area (summer 2011)

- Use statistical analysis to correlate mosquito abundance with physical habitat characteristics and thus map areas most suited for habitat (by early 2012).

- Train students, researchers and stakeholders on use of SERVIR data portal and fundamentals of GIS and remote sensing (~ 1 week during winter 2011-12) (January, 2012)

Mosquito Sampling Areas

- Measurements of mosquito (larvae, pupae and adult) abundance will be made at 50 or more locations in each of 12 cities during July – September 2011.

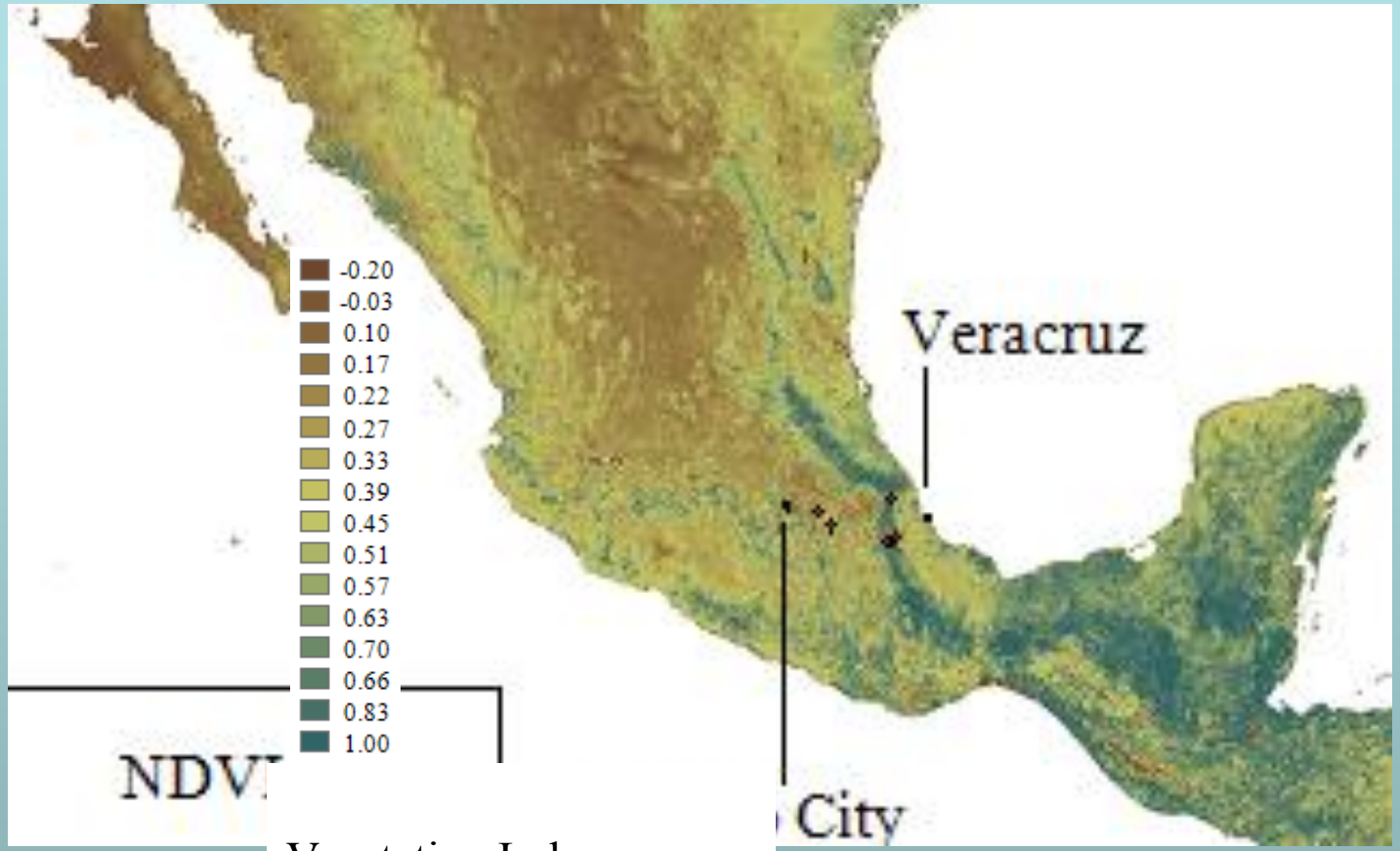
July, 2011

Satellite Data – Land Cover

2009 Land Cover

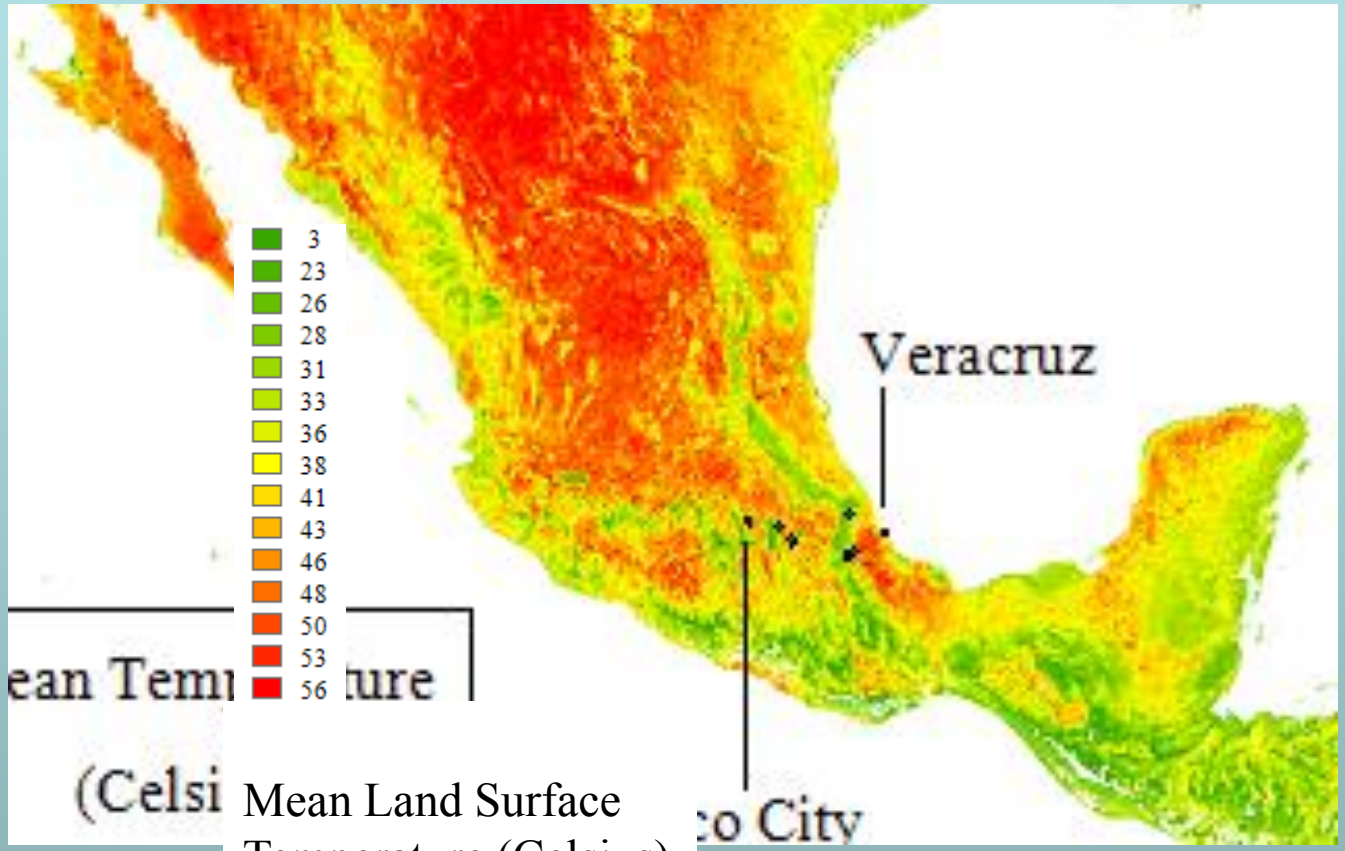
1	Evergreen Needle-leaf forest
2	Evergreen Broadleaf forest
3	Deciduous Needle-leaf forest
4	Deciduous Broadleaf forest
5	Mixed forest
6	Closed shrub-lands
7	Open shrub-lands
8	Woody savannas
9	Savannas
10	Grasslands
11	Permanent wetlands
12	Croplands
13	Urban and built-up Cropland/Natural vegetation
14	mosaic
15	Snow and ice
16	Barren or sparsely vegetated

Satellite Data – Vegetation Amount



Vegetation Index
17 May 2011

Satellite Data – Surface Temperature



Mean Land Surface Temperature (Celsius)
18-31 May 2011

Schedule

	Year 1		Year 2	
NASA ROSES Proposed Project Activities and Milestones	**Q1/Q2**	**Q3/Q4**	**Q1/Q2**	**Q3/Q4**
Obtain satellite data for region over study period				
Analyze satellite data (characterize means, spatial and seasonal variability of temperature, humidity, soil moisture, vegetation, precipitation, etc.)				
Provide satellite-derived products for mosquito model development				
Year one Project Report				
Develop curriculum for workshops				
Conduct SERVIR workshops				
Final NASA Report				
Publish results in scientific journals				

NSF FundedSchedule

Current NSF Funded Project Activities and Milestones	Q1/Q2	Q3/Q4	Q1/Q2	Q3/Q4
Establish field sites (household, cemetery, school)				
Deploy data loggers, collect environmental data				
Collect mosquito habitat data (prepare, train workers, conduct field work)				
Conduct focus group meetings with community leaders				
Survey development and testing				
Conduct survey and analyze data				
Develop and run mosquito presence/abundance model				
Perform meteorological modeling with WRF/Noah				
Integrate biophysical and social data into models				
Provide output of mosquito model to SERVIR				
Develop curriculum for workshops				
Conduct workshops for students				